Dimorphic Development and Alternation of Generations in the Cladocera.

Dr. G. O. Sars has discovered a remarkable dimorphism and alternation of generations in *Leptodora hyalina* ("Om en dimorph Udvikling samt Generationsvexel hos *Leptodora*," Forhandlinger Vidensk.-Selsk. Christiania for 1873, p. 15, and plate). The development from the ordinary summer-eggs, as already described by E. P. Müller, is without metamorphosis and like that of ordinary Cladocera, the young when excluded from the egg agreeing essentially with the adult; while, according to Sars's observations, the young are excluded from the winter-eggs in a very imperfect condition, quite unlike the known young of any other Cladocera, and pass through a marked postembryonal metamorphosis. In the earliest observed stage of the young of this form, the body is obovate, wholly without segmentation, the compound eye wanting, while there is a simple eye between the bases of the antennulæ, the swimming-arms (antennæ) well developed, and the six pairs of legs represented only by minute processes projecting scarcely beyond the sides of the body. But the most remarkable feature is the presence of a pair of appendages tipped with cilia and nearly as long as the body, which are evidently homologous with the mandibular palpi of other Crustaceans, although these appendages have always been supposed to be wanting in the species of Cladocera. Two subsequent stages, gradually approaching the adult form, are described. The adults from the winter-eggs have no vestige of the mandibular palpi left; yet the simple eye (which is wholly absent in ordinary individuals developed from summer-eggs) is persistent, and thus marks a distinct generation. Three stages of the young from winter-eggs are beautifully figured upon the plate accompanying the memoir.

This remarkable species has, still more recently, been made the subject of a very elaborate memoir by Prof. Weismann of Freiburg ("Ueber Bau und Lebenserscheinungen von *Leptodora hyalina*," Zeitschrift für wissensch. Zool. xxiv., Sept. 1874, pp. 349–418, plates 33–38), who, however, had not observed the peculiar development of the winter-eggs. The occurrence of this genus in Lake Superior is noticed in this Journal, vol. vii. p. 161, 1874.—*Silliman's American Journal*, March 1875.

On the Actiniæ *of the Oceanic Coasts of France.*

By M. P. Fischer.

The Actiniæ of the oceanic coasts of France (comprising in that geographical region the Anglo-Norman isles) number thirty-one species:—*Cerianthus membranaceus*, Gmelin; *Edwardsia Harassii*, Quatrefages; *E. tumida*, Quatref.; *E. Beautempsi*, Quatref.; *E. callimorpha*, Gosse; *Halcampa chrysanthellum*, Peach; *Peachia undata*, Gosse; *P. triphylla*, Gosse; *Anemonia sulcata*, Pennant; *Aiptasia Couchi*, Cocks; *Actinia equina*, Linné; *Metridium dianthus*, Ellis; *Cereus pedunculatus*, Pennant; *Sagartia nivea*, Gosse; *S. viduata*, Müller (including *S. troglodytes*, Johnston); *S. venusta*,

Gosse; *S. miniata*, Gosse; *S. sphyrodeta*, Gosse; *S. pellucida*, Hollard; *S. ignea*, Fischer; *S. erythrochila*, Fischer; *S. effœta*, Linné; *Adamsia palliata*, Bohadsch; *Chitonactis coronata*, Gosse; *Bunodes verrucosus*, Pennant; *B. Balli*, Cocks; *B. biscayensis*, Fischer; *Tealia felina*, Linné; *Corynactis viridis*, Allman; *Palythoa Couchi*, Johnston; and *P. sulcata*, Gosse. Of these thirty-one species, twenty-five (that is to say, about five sixths) inhabit the seas of Great Britain, and have been described in the 'Actinologia Britannica' of Mr. Gosse. The six species which are wanting in England are *Cerianthus membranaceus*, *Edwardsia Harassii*, *E. tumida*, *Sagartia ignea*, *S. erythrochila*, and *Bunodes biscayensis*. The *Cerianthus* belongs to the Mediterranean fauna, as, perhaps, does also *Sagartia erythrochila*.

The twenty-five species of our coasts which inhabit the English seas only furnish three species which extend as far as the Mediterranean; these are *Anemonia sulcata*, *Actinia equina*, and *Adamsia palliata*.

Our French actinological fauna nevertheless differs from that of the coasts of Great Britain by the absence of several genera which have an eminently boreal character, and which are found chiefly in the Shetlands and north of Scotland; such are the genera *Phellia*, *Gregoria*, *Bolocera*, *Hormathia*, *Stomphia*, *Ilyanthus*, *Capnea*, *Aureliania*, and *Zoanthus*. One can hardly cite three species of Actiniæ in the Mediterranean which are wanting on our oceanic coasts. We may conclude from this that, if our ocean shores possess many Actiniæ and few Gorgoniæ and Corals*, the Mediterranean presents the opposite condition.

The bathymetric distribution of the Actiniæ is very simple; they nearly all live in shallow water; they are only found in the littoral zones, and that of the Laminariæ (0–28 metres) and Nullipores (28–72 metres). Beyond this point occur the greater part of the Corals which characterize the following zone, that of Brachiopods and Corals (72–184 metres).

In the littoral zone *Actinia equina*, *Anemonia sulcata*, *Sagartia ignea*, *S. erythrochila*, *Bunodes verrucosus*, *Palythoa sulcata*, &c. chiefly live.

The Laminarian zone is principally inhabited by the non-adherent Actiniæ, as well as by *Metridium dianthus*, *Sagartia sphyrodeta*, *S. pellucida*, &c.

In the zone of Nullipores, or of the great *Buccina*, we dredge up on shells *Sagartia effœta*, *S. viduata*, *Adamsia palliata*, *Chitonactis coronata*, and *Palythoa Couchi*.

All zoologists who have attended to the specific distinction of the Actiniæ have sought to establish the number of cycles and the number of tentacles in each cycle. The number of cycles is not absolute; it is not uncommon to find one cycle more or less in adult specimens of the same species: thus *Tealia felina* has five

* The Corals of our oceanic shores are *Caryophyllia Smithi*, *Dendrophyllia cornigera*, *Desmophyllum crista-galli*, and *Paracyathus striatus*. The Gorgoniæ are *Gorgonia verrucosa*, *Pterogorgia rhizomorpha*, and *Muricea placomus*.

cycles (10, 10, 20, 40, 80) on the coasts of Normandy, and only four cycles (10, 10, 20, 40) on the English coasts*; but I attach little importance to this fact.

As to the number of tentacles in each cycle, it deserves careful examination; if anomalies exist, if certain individuals escape from all rule, it is none the less evident that one may point out archetypes for the greater number of species.

1. The type with 6 tentacles and its multiples (12, 24, 48, &c.) is the commonest; it is this that has induced some observers to suppose that all the Actiniæ were derived from it. From the observations of Mr. Gosse, and from my own, this type exists in about twenty Actiniæ of the European seas. The *Bunodes*, among others, may be considered as perfect Hexactiniæ.

2. The type with 8, and multiples of 8, tentacles is very frequent. It is indicated for nine species, to which, probably, the *Cerianthi* may be added.

3. The type with 10 tentacles is only seen in *Tealia felina*†.

4. *Palythoa sulcata* alone has 11 tentacles.

5. These various types combine among themselves; thus the formula of *Edwardsia carnea* would be 8, 8, 12, and that of *Corynactis viridis* 16, 24, 32, 32.

6. Lastly, there exist indeterminate types; must we refer to type 6, 12, &c., or to a type 9, 18, and its multiples, the two following species—*Anemonia sulcata* (36, 36, 36, 72) and *Ilyanthus Mitchelli* (18, 18)? What is the type of *Aureliania angusta*, of which the marginal series is composed of 42 tentacles? *Palythoa Couchi* has, according to my observations, 2 cycles of 14–15 tentacles. Mr. Gosse attributes to it 24 tentacles (12, 12) in the young, and 28 (14, 14) in the adults, which would prove that at one time this species is a Hexactinia.

These facts make one think that, in the zoological group of the Actiniæ, the number of tentacles has not the value that has been attributed to it. The type has not even the importance of a generic character, since in the genera *Sagartia*, *Phellia*, *Halcampa*, and *Edwardsia* certain species have 8, and others 12 tentacles and their multiples.

The variability of the number of tentacles is explained by the embryogeny of the Actiniæ, the embryo having successively 4, 6, 8, 10, and 12 dissepiments and tentacles. By assuring an arrest of development at each of these periods, we obtain the various types which correspond to them; and in certain species the normal combination of the two types (*Edwardsia carnea* and *Corynactis viridis*) faithfully represents the normal development of a Hexactinia, which passes from 8 to 12 dissepiments and tentacles. Seeing how much the tentacular type varies in the Actiniæ, one may also doubt the importance of the number of systems and cycles in the Corals.

* In the same way *Sagartia sphyrodeta* has 5 cycles (8, 8, 16, 32, 64) on our coasts, and 4 cycles in England (8, 8, 16, 16), according to Gosse.

† L. Agassiz has discovered in America a species (*Rhodactinia Dœvisii*) of the same type. Its embryos have 10 tentacles only.

Nevertheless I am struck with this circumstance, that the rugose Corals, with a tetrameral type, are hardly ever found, except in the transition-rocks; they therefore preceded the secondary Corals of the hexameral type, just as in the embryos of our living Actiniæ we see appear 4 and then 6 tentacles. The history of the organisms on the surface of the earth consequently resembles the development of an existing animal.

Some species of the Actiniæ seem to be reproduced with the greatest facility by means of little fragments abandoned by the foot. I have ascertained this process of multiplication in all the individuals of *Sagartia pellucida* * that I kept in captivity in 1872 and 1874. Dicquemare discovered the strange fact in *Metridium dianthus*.

Spontaneous scissiparity is, on the contrary, the most common mode of propagation in *Sagartia ignea*. I have observed it also in *Anemonia sulcata* †. It never takes place in *Sagartia effœta*, and in many other species which I have examined. The tendency to scissiparity and to reproduction by means of the fragments of the foot would have nearly the value of a specific character.—*Comptes Rendus*, November 23, 1874, p. 1207.

Action of Light on the Development of the Young of Frogs.

M. Thury took the eggs of *Rana temporaria* and placed them all under precisely the same favourable circumstances, except that while part received light through colourless glass, another part received it through green glass. The former developed rapidly, and by the end of May had a length of four centimetres, and well developed hind legs in most of them; while the latter were slowly developed, blackish in colour, hardly had a length of two centimetres by the end of May, and were without a trace of the hind legs. By the 10th of June the former had their fore legs and some were changed to frogs; the latter, still black, had no trace of legs, and breathed almost exclusively by means of their gills. By the 15th of July all the former had become frogs; but those of the latter still had no legs, and by the 2nd of August they were all dead without a trace of legs having appeared. Some of the young of the latter lot, transferred to the vessel of the former on the 15th of July, finished their metamorphosis. At the same time some of the former transferred to the vessel containing the latter continued to develop, showing the influence of the first impulse in their development.—*L'Institut*, Dec. 23, 1874.

* On the 23rd of August, 1872, a *Sagartia pellucida* abandoned about ten fragments of the foot; on the 25th of August they became rounded; on the 5th of September one of them bore 8 tentacles; on the 7th of September the same fragment presented 15 or 16 tentacles.

† On the 18th of September, 1874, an *Anemonia sulcata* divided spontaneously, brought together its divided integuments; on the 21st of September the new-formed disk spread out, and the rudiments of the new tentacles were seen; on the 28th of September there were 20 tentacles.